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NOV 29 2006

## CLAIM AMENDMENTS

**Please amend claims 21, 38, and 40 as follows:**

1. (Previously Cancelled)
2. (Previously Cancelled)
3. (Previously Cancelled)
4. (Previously Cancelled)
5. (Previously Cancelled)
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16. (Previously Cancelled)
17. (Previously Cancelled)
18. (Previously Cancelled)
19. (Previously Cancelled)
20. (Previously Cancelled)
21. (Currently Amended) A neural network system, comprising:

a physical neural network comprising a liquid dielectric solution composed of a plurality of nanoconductors and a liquid dielectric solvent, said liquid dielectric solution disposed in a connection gap formed between at least one pre-synaptic electrode and at least one post-synaptic electrode, wherein nanoconductors among said plurality of nanoconductors align to form neural network nanoconnections between said pre-synaptic and post-synaptic electrodes within said liquid dielectric solution when said plurality of nanoconductors suspended in said liquid dielectric solution within said connection gap is subject to a dielectrophoretic force when exposed to an electric field, such that said neural network nanoconnections are strengthened or weakened according to an application of said electric field, a frequency of said electric field, or a combination thereof to provide said neural network nanoconnections; and

a liquid state machine formed from and associated with said physical neural network including said neural network nanoconnections, wherein said liquid state machine stores via patterns of neural activations of said physical neural network, a recent past history of said liquid state machine.

22. (Previously Submitted) The system of claim 21 wherein the more nanoconductors among said plurality of nanoconductors that align as said electric field is applied across said connection gap, the stronger said neural network nanoconnections become and wherein neural network nanoconnections among said neural network connections that are not utilized dissolve back into said liquid dielectric solution.

23. (Previously Submitted) The system of claim 21 further comprising:

at least one state-extracting neural circuit for extracting at least one state of said liquid state machine from said liquid state machine; and

wherein said neural network connections of said liquid state machine are random.

24. (Previously Submitted) The system of claim 23 wherein said at least one state-extracting neural circuit comprises a perceptron, wherein said perceptron adjusts a synaptic weight of said perceptron in order to produce a desired output.

25. (Previously Submitted) The system of claim 24 wherein said perceptron comprises a read-out neuron that generates a linear mapping between at least one neural circuit within said liquid state machine and an output of said read-out neuron.

26. (Previously Submitted) The system of claim 21 wherein said at least one pre-synaptic electrode is located perpendicular to said at least one post-synaptic electrode.

27. (Previously Submitted) The system of claim 26 wherein said at least one pre-synaptic electrode and said at least one post-synaptic electrode are located adjacent one another in a near-crossing configuration.

28. (Previously Submitted) The system of claim 21 further comprising a supervised learning mechanism associated with said liquid state machine, whereby connections strengths of said neural network nanoconnections within said connection gap are determined by pre-synaptic and post-synaptic activity respectively associated with said at leas tone pre-synaptic electrode and said at least one post-synaptic electrode.

29. (Previously Submitted) The system of claim 28 wherein said liquid state machine comprises a supervised learning mechanism.

30. (Previously Submitted) The system of claim 29 wherein said supervised learning mechanism comprises at least one perceptron.

31. (Previously Submitted) The system of claim 21 wherein said physical neural network further comprises at least one connection network associated with at least one neuron-like node wherein said at least one connection network comprises a plurality of said neural network nanoconnections, including a plurality of interconnected nanoconductors, wherein each nanoconductor of said plurality of interconnected nanoconductors is strengthened or weakened according to said application of said electric field, said frequency, or a combination thereof.

32. (Previously Submitted) The system of claim 31 wherein:

each nanoconductor of said plurality of interconnected nanoconductors experiences an increase in alignment in accordance with an increase or a decrease in said electric field, said frequency, or said combination thereof;

wherein nanoconductors of said plurality of interconnected nanoconductors that are utilized most frequently by said at least one neuron-like node become stronger with each use thereof;

and wherein nanoconductors of said plurality of interconnected nanoconductors that are utilized least frequently become increasingly weak and eventually become unaligned.

33. (Previously Submitted) The system of claim 21 further comprising a plurality of perceptrons $P_1$ to $P_n$ that are configured to permit said plurality of perceptrons $P_1$ to $P_n$ to make random connections into said liquid state machine associated with said physical neural network.

34. (Previously Submitted) The system of claim 21 further comprising:

a gate located adjacent said connection gap;

an insulator located between said gate and said connection gap;

a logic circuit located to said gate; and

wherein said at least one pre-synaptic electrode comprises a source and said at least one post-synaptic electrode comprises a drain.

35. (Previously Submitted) The system of claim 34 wherein said insulator comprises an oxide-based insulation material.

36. (Previously Submitted) The system of claim 21 wherein said nanoconductors comprises semi-conducting materials.

37. (Previously Submitted) The system of claim 36 wherein said electric field comprises an AC field formed across said connection gap, thereby strengthening or weakening said neural network nanoconnections in order to accomplish a Spike-Timing Dependent-Plasticity (STDP) rule-based operation.

38. (Currently Amended) A neural network system, comprising:

a physical neural network comprising a liquid dielectric solution composed of a plurality of nanoconductors and a liquid dielectric solvent, said liquid dielectric solution disposed in a connection gap formed between at least one pre-synaptic electrode and at least one post-synaptic electrode, wherein nanoconductors among

said plurality of nanoconductors align to form neural network nanoconnections between said pre-synaptic and post-synaptic electrodes within said liquid dielectric solution when an electric field is applied across said connection gap, thereby subjecting said plurality of nanoconductors to a dielectrophoretic force, such that said neural network nanoconnections are strengthened or weakened according to said application of said electric field, a frequency of said electric field, or a combination thereof to provide said neural network nanoconnections;

a liquid state machine formed from and associated with said physical neural network including said neural network nanoconnections, wherein said liquid state machine stores via patterns of neural activations of said physical neural network, a recent past history of said liquid state machine;

a plurality of perceptrons in communication with said liquid state machine and said physical neural network, wherein said plurality of perceptrons extracts at least one state of said liquid state machine from said liquid state machine.

39. (Previously Submitted) The system of claim 38 wherein said perceptron comprises a read-out neuron that forms a linear mapping between at least one neural circuit within said liquid state machine and an output of said read-out neuron.

40. (Currently Amended) A neural network system, comprising:

a physical neural network comprising a liquid dielectric solution composed of a plurality of nanoconductors and a liquid dielectric solvent, said liquid dielectric solution disposed in a connection gap formed between at least one pre-synaptic electrode and at least one post-synaptic electrode, wherein said nanoconductors when subject to a dielectrophoretic force as a result of an exposure to an electric field align to form random neural network nanoconnections between said pre-

synaptic and post-synaptic electrodes within said liquid dielectric solution when said ~~an~~ electric field is applied across said connection gap, such that said random neural network nanoconnections are strengthened or weakened according to said application of said electric field, a frequency of said electric or a combination thereof to provide said random neural network nanoconnections;

a gate located adjacent said connection gap in association with an insulator located between said gate and said connection gap, a logic circuit located to said gate, and wherein said at least one pre-synaptic electrode comprises a source and said at least one post-synaptic electrode comprises a drain; and

a liquid state machine formed from and associated with said physical neural network including said random neural network nanoconnections, wherein said liquid state machine stores via patterns of neural activations of said physical neural network, a recent past history of said liquid state machine.

41. (Previously Submitted) The system of claim 40 further comprising at least one state-extracting neural circuit for extracting at least one state of said liquid state machine from said liquid state machine, said at least one state-extracting neural circuit comprising a perceptron that adjusts a synaptic weight of said perceptron in order to produce a desired output, said perceptron generating a linear mapping between at least one neural circuit within said liquid state machine and an output of said read-out neuron.